

## **Sec. 29-21.5. Wind Energy Conversion Systems.**

### **(a) Purpose and Intent.**

It is the goal of the City of Columbia to enable citizens to pursue alternative and sustainable energy sources for their homes. In accordance with this goal, the city finds that it is in the public interest to encourage alternative energy systems, particularly wind energy conversion systems (WECS), that have a positive impact on energy production and conservation while not adversely impacting the community.

### **(b) Definitions.**

As used in this section, the following terms shall have the meanings and usages indicated.

Ambient Sound Level. The sound pressure level exceeded 90% of the time or L90 at a given location. Also, the amount of background noise at a given location prior to the installation of a WECS, which may include, but is not limited to, traffic, machinery, general human activity, and the interaction of the wind with the landscape. Ambient Sound Level is measured on the Decibel dB(A) weighted scale as defined by the American National Standards Institute (ANSI).

Axis. The plane on which a rotor or other wind-harnessing mechanism rotates. The City of Columbia's regulations do not differentiate between horizontal- and vertical-axis WECS.

Boone Electric Cooperative (BEC). The electric utility serving outlying areas of the City of Columbia and Boone County.

Columbia Water and Light (CWL). The City of Columbia's electric utility. CWL serves the majority of the area inside the City limits.

Decibel. The unit of measure used to express the magnitude of sound pressure and sound intensity. Commonly abbreviated as dB(A).

Fall Zone. The area in which a tower could collapse in the event of a structural failure.

Feeder Line. Any power line that carries electrical power from one or more wind turbines or individual transformers associated with an individual wind turbine to the point of interconnection with the electric power grid, in the case of interconnection with the high voltage transmission systems the point of interconnection shall be the substation serving the WECS.

Generator Nameplate Capacity/Nameplate Capacity (Installed). The maximum rated output of a generator, prime mover, or other electric power production equipment under specific conditions designated by the manufacturer. Installed generator nameplate capacity is commonly expressed in kilowatts (kW) or megawatts (MW) and is usually indicated on a nameplate physically attached to the generator.

Height, Total System. The height above grade of the WECS, including the generating unit and the highest vertical extension of any blades or rotors.

Off-grid. An electrical system that is not connected or is not permitted to be connected to any utility distribution and transmission facility or to any building or structure that is connected.

Property Line. For the purposes of this section only, the boundary line of the area over which the entity applying for WECS permit has legal control for the purposes of installation of a WECS. This control may be attained through fee title ownership, easement, or other appropriate contractual relationship between landowners.

**Rotor.** An element of a WECS that acts as a multi-bladed airfoil assembly, thereby directly extracting through rotation the kinetic energy of wind.

**Rotor Diameter.** The diameter of the circle described by the rotor blades. See also *Swept Area*.

**Shadow Flicker.** Alternating changes in light intensity, caused by the moving blades of a wind energy conversion system, that cast moving shadows on the ground and stationary objects.

**Sound Pressure Level.** The sound measurement commonly reported in decibels [dB(A)].

**Swept area.** The diameter of the least circle encompassing all blades for a WECS. Also any and all portions of overhanging blades, turbines, or attachments that oscillate, rotate or otherwise move, which are not part of the fixed structural elements of the Wind Energy Conversion System, including those on vertical axis WECS. See also *Rotor Diameter*.

**Tower.** The vertical component of a WECS that elevates and supports the wind turbine generator, rotor blades, and other equipment above the ground.

**Total Height.** The height, including the nacelle, rotor blades, or other appurtenances attached to the supporting structure, of the WECS.

**Wind Energy Conversion System (WECS).** The configuration of components including the base, tower, generator, rotor blades, and related equipment to convert the kinetic energy of wind into electrical energy (e.g. windmill or wind turbine). A wind energy conversion system which has a nameplate rated capacity of up to one hundred (100) kilowatts and is incidental and subordinate to a principal use on the same parcel.

**Wind Energy Conversion System, Building-Mounted.** A WECS that is securely fastened to any portion of a principal building in order to achieve desired elevation, whether attached directly to the principal building or attached to a tower structure which is in turn fastened to the principal building. A building-mounted WECS is not a minor projection, as defined in Section 29-26 (b).

**Wind Energy Conversion System, Collocated.** A Wind Energy Conversion System that is mounted on a tower or pole structure which serves another primary purpose, such as a flagpole.

**Wind Energy Conversion System, Commercial.** A Wind Energy Conversion System which is intended to produce electricity for sale to a rate-regulated or non-regulated utility or for use off site. For the purpose of this ordinance, a commercial WECS has a total nameplate generating capacity equal to or greater than 100 kW.

**Wind Energy Conversion System, Freestanding.** A Wind Energy Conversion System which is elevated by means of a monopole tower and is not located on another supporting structure. Guyed, lattice, or other non-monopole style towers shall not meet this definition.

**Wind Energy Conversion System, Horizontal Axis.** A WECS that has blades which rotate through a horizontal plane.

**Wind Energy Conversion System, Interconnected.** A WECS that is properly permitted and connected to the local utility grid system.

**Wind Energy Conversion System, Non-Commercial.** A WECS of less than 100 kW in total nameplate generating capacity that is not operated on a for-profit basis. A WECS that is interconnected with the pertinent electric utility or that receives credits or rebates for energy transmitted to the power grid is not by that reason alone operated on a for-profit basis.

Wind Energy Conversion System, Small. A WECS of less than 10 kW in total nameplate generating capacity.

Wind Energy Conversion System, Vertical Axis. A WECS that has blades which rotate through a vertical plane.

Wind Turbine. A piece of electrical generating equipment that aids in the conversion of the kinetic energy of wind into electrical energy.

**(c) Permitted Uses.**

- (1) One non-commercial Wind Energy System (WECS) shall be allowed as an accessory use to a permitted principal use on the same lot, on lots meeting setback and fall zone requirements [see subsection (h), height and area regulations], in districts R-1, R-2, R-3, R-4, RMH, PUD, and A-1.
- (2) Two non-commercial WECS shall be allowed as accessory uses to a permitted principal use on the same lot, on lots meeting setback and fall zone requirements, [see subsection (h), height and area regulations], in districts O-1, O-2, O-P, C-1, C-2, C-3, C-P, M-R, M-C, M-P, M-1.
- (3) Notwithstanding subsections (1) and (2), WECS shall not be permitted uses within the boundaries of the Downtown Community Improvement District as defined in the petition approved by Ordinance 20866.
- (4) Commercial WECS are not allowed in any zoning district.

**(d) Conditional Uses.**

- (1) A WECS shall be allowed only after the issuance of a conditional use permit in all locations where WECS are not allowed as permitted uses. Where one or two WECS are allowed as permitted uses, additional WECS shall be allowed only after the issuance of a conditional use permit.
- (2) Applications for conditional use permits shall be filed and processed in the manner established in section 29-23. In addition, the application shall include the following information:
  - a. The name(s) of project applicant(s)
  - b. The name(s) of the project owner(s)
  - c. The legal description and address of the project
  - d. A description of the project including: number, type, name plate generating capacity, tower height, rotor diameter, and total height of all wind turbines and means of interconnecting with the electrical grid and an anticipated construction schedule.
  - e. A site plan, drawn to scale, including the location of property lines, wind turbine(s), electrical wires, interconnection points with the electrical grid, all related accessory structures, and physical features and land uses of the project area, both before and after construction of the proposed project. The site plan shall include 1) the project area boundaries, 2) the location, height, and dimensions of all existing and proposed structures, 3) the location, and dimensions of all temporary and permanent on-site roads or drives, 4) existing topography, and 5) all new infrastructure above ground related to the project.
  - f. An engineer's certification that the tower structure, foundation, and design is within accepted professional standards, given local soil and climate

conditions. Manufacturer certification and specification sheets may, at the discretion of the Building Official, be used in place of engineering certification. For building-mounted WECS, a written analysis from a Missouri-licensed structural engineer determining that installation of a WECS will not cause damage to the structure and that the WECS can be securely fastened so as to not pose a hazard caused by detaching from the structure.

- g. Documentation of land ownership or legal control of the property
- h. A copy of the interconnection agreement application with the applicable utility if connecting to the grid
- i. Those WECS that are not connected to the electric grid shall identify the location of any battery or other storage device
- j. Copy of the shadow flicker analysis, if required. *This shall apply only to systems greater than 10kW in nameplate generating capacity.* No WECS shall be installed and operated in a manner that causes shadow flicker to fall on or in any residential dwelling existing at the time the application to install a WECS is received by the city. The applicant has the burden of proving that this effect does not have significant adverse impact on neighboring or adjacent uses, either through siting or mitigation. Shadow flicker expected to fall on an adjacent parcel or roadway may be acceptable if the flicker does not exceed thirty (30) hours per calendar year. If such flicker is likely, the applicant shall, at the applicant's sole expense, furnish a flicker study for City review.

**(e) Procedures for Permits.**

**(1) Permit Required:**

- a. It shall be unlawful to construct, erect, install, alter or locate any WECS within the City of Columbia, unless a building permit has been obtained. The building permit may be revoked by the building official any time the approved system does not comply with the rules set forth in this Section.
- b. Authorization for interconnection to the electric grid is independent of the approval for the WECS building permit. If an interconnected system is planned, the applicable utility's interconnection requirements must also be satisfied, and no building permit shall be issued until the Building Official has been provided with that utility's written authorization.

(2) Procedures for Permits - Building and (if necessary) Conditional Use Permits and Variances shall be applied for and reviewed under the procedures established in this chapter, except where noted below. The Director of Public Works, upon written request of the applicant, may waive any of the submittal requirements that the director deems not applicable after reviewing the request. Applicants desiring such a waiver shall provide supporting documentation from a licensed engineer justifying the waiver. The Director may also require additional information as minimally needed to determine compliance with the City Code.

- a. The application for all WECS building permits shall include the information found in subsection (d) (2), items a-j inclusive

**(f) General Requirements and Construction.**

(1) Tower: Only monopole towers are permitted for freestanding WECS. Guyed or any other types of towers are not permitted.

- a. Color and Surface: Freestanding WECS shall be a neutral color such as white, sky blue, or light gray. Supporting structures for building mounted WECS shall match the color of the building on which they are mounted. Surfaces of the WECS and building mounted supporting structures shall be a non-reflective, matte finish.
  - b. Signage and Visual impact: No lettering, advertising, or graphics other than a standard manufacturer's insignia shall be on any part of the tower, hub, or blades. No other signage or message may be displayed, other than for safety or apparatus identification (e.g. nameplate, serial number, or emergency instructions). The applicant shall avoid state or federal scenic areas and significant visual resources listed in the City's comprehensive plan.
  - c. Climbing Apparatus: The tower must be designed to prevent climbing within the first ten (10') feet.
- (2) Lighting: No lights shall be installed on the tower, unless required to meet FAA guidelines, where lighting intensity and frequency of strobe shall adhere to requirements established by FAA permits and regulations. Red strobe lights are preferred for nighttime illumination and to reduce impacts on migrating birds. Red pulsating incandescent lights shall be prohibited unless required by the FAA.
- (3) Compliance: All WECS equipment and connections must adhere to all applicable local and state, codes and relevant national and international standards. In case of noncompliance, the applicant may be required to hire outside inspectors as deemed necessary by the Building Official or Board of Adjustment.
- (4) Maintenance: Facilities shall be installed and maintained in accordance with manufacturer's specifications. The property owner of any WECS shall maintain such system in a safe and attractive manner, including replacement of defective parts, painting, cleaning, and other acts that may be required for the maintenance and function of such a system. Failure to maintain the WECS may result in enforcement action including, but not limited to, citations, fines, and/or revocation of permits in accordance with City Code.
- (5) Noise, Vibration, and Sound Pressure Level: A WECS shall be designed, installed and operated so that any noise or vibration has minimal impact on adjacent properties. A WECS shall not exceed 55 dB(A) at any adjacent property line. This sound pressure level may be exceeded during short-term events such as utility outages or severe wind storms. If the ambient sound pressure level for the WECS location exceeds 55 dB(A), the maximum standard shall be ambient dB(A) plus 5 dB(A). No WECS shall emit low frequency sound at or below 20 Hertz. The process for reporting and investigating a noise complaint is outlined below:
- a. Upon written notification of a complaint of excessive noise, the Building Official or designated representative of the Public Works Department, (the "Enforcing Person"), shall record the filing of such complaint, and promptly investigate it. If noise levels are determined to be in excess of the maximum standard, the Enforcing Person shall require the property owner to perform ambient and operating decibel measurements at the nearest point from the wind turbine to the property line of the complainant and to the nearest off-site, inhabited residence.

- b. If the noise levels are found to have exceeded the allowable limit, the Enforcing Person shall notify, in writing, the owner of the WECS site to correct the violation. If the noise violation is not remedied within 30 days, the WECS shall remain inactive until the noise violation is remedied, which may include (but is not limited to) relocation or removal at the owner's expense.
  - c. If it is determined that maximum noise limits have not been exceeded, notice in writing shall be provided to the person who has filed such complaint and the owner of the WECS property stating that no further action is required, within 21 days of the receipt of the request. Any person aggrieved by the decision may appeal the decision to the Board of Adjustment in accordance with Section 29-31. Any such appeal must be filed within 30 days of receipt of the Enforcing Person's decision.
- (6) Interconnection and utility considerations: The applicant shall notify and apply with the appropriate electric utility in making a WECS application to install an interconnected, customer-owned WECS. The WECS shall meet the requirements for interconnection and operation as set forth by the utility, and shall not be interconnected to any utility-operated power line or by any other means of conveyance until so authorized by the utility. Interconnected WECS shall require the approval of the applicable utility before receiving permits from the City. Off-grid (not connected to the utility) systems shall be exempt from this application requirement. A response from the utility is not required to approve or deny an off-grid WECS application.
  - (7) Restriction on use of Electricity Generated: A WECS shall be used exclusively to supply electrical power to the owner for on-site consumption, except that excess electrical power generated by the WECS and not presently needed for use by the owner may be used by the Utility in accordance with laws and regulations governing interconnection and utility approval.
  - (8) Feeder Lines: All communications and feeder lines installed as part of a WECS shall be buried where feasible.
  - (9) Displacement of Parking/Landscaping Prohibited: The location of the WECS shall not result in the net loss of required parking or landscaping as specified elsewhere in the zoning code.

**(g) Safety Design Requirements and Standards.**

- (1) A WECS shall have automatic braking, governing, and a feathering system to prevent uncontrolled rotation or over-speeding. All WECS shall have lightning protection, and shall comply with FAA standards. The system shall also be capable of stopping power generation in the event of a power outage so as to prevent back-feeding of the grid.
- (2) A clearly marked and easily accessible power shut off/disconnect will be required as determined by the Building Official. Any battery or energy storage device will be clearly marked, and a sign indicating the presence of such device(s) shall be posted at the site's electric meter.
- (3) No portion of the WECS swept area shall be closer than 20 feet to the ground. The swept area shall extend no closer than 20 feet horizontally to the nearest

tree, structure, or above-ground utility facility. No WECS shall be constructed so that any part thereof can extend within 20 feet laterally of an overhead electrical power line (excluding secondary electrical service lines or service drops).

- (4) A sign or signs shall be posted on the tower, transformer and substation warning of high voltage. A sign shall also be posted at the property's electric meter, noting the presence of a WECS and any battery system. Signs with emergency contact information shall also be posted on the turbine or at another suitable point, such as the entrance to the WECS's service area.
- (5) No WECS installation shall cause electromagnetic interference. If interference is established, the Building Official shall notify the owner of the property in writing to correct the violation. If the interference is not remedied within 30 days the WECS shall remain inactive until the interference is remedied, which may include (but is not limited to) relocation or removal at the WECS owner's expense.

**(h) Height and Area Regulations.**

- (1) Setbacks:
  - a. The minimum distance between any freestanding WECS and any property line shall be a distance that is equivalent to the total system height. The setback shall be measured from the property line to the point of the WECS structure closest to the property line.
  - b. The required setback for any building-mounted WECS shall be equal to the required setback of the principal building to which the WECS is to be attached at such time that the application to install the WECS is received by the city. If no setback exists for the lot, the fall zone shall determine the setback (see following paragraph). Section 29-26, regarding allowable minor projections into required setbacks, is not applicable.
- (2) The fall zone for a freestanding WECS shall be 90 percent of the total height of the structure. For building-mounted WECS, the fall zone shall be 50 percent of the total height from ground level. The fall zone shall be entirely contained on the subject parcel. In no case may the fall zone radius include an overhead electrical power line. The setback from underground electric distribution lines shall be at least five (5) feet.
- (3) Maximum height shall be the total system height, as defined in this section.
  - a. In the R-1, R-2, R-3, and R-4 districts, 41 feet
  - b. In the C-1 and C-3 districts, 60 feet
  - c. In the O-1 and O-2 districts, 90 feet
  - d. In the C-2, M-1, M-R, and M-C districts, 120 feet
  - e. For lots greater than three (3) acres, 150 feet
  - f. In all planned districts, height shall be as proposed in the statement of intent, subject to review and approval by the Planning Commission and City Council

Maximum height may be exceeded via a conditional use permit request to the Board of Adjustment. The applicant must demonstrate that additional height is

needed and that the benefits of the taller wind turbine do not increase any adverse impacts.

Note: For lots in the A-1 zoning district, a maximum height of 75 feet is allowed for windmills on agriculturally-used parcels under current zoning district standards; this standard shall apply to all WECS applications on parcels of three (3) acres or less in the A-1 district.

- (4) Other regulations:
- a. Building-mounted WECS may not exceed the maximum principal building height by more than six (6) feet in residential districts and 15 feet in all other districts. Section 29-26, regarding height exceptions, is not applicable, except for the provisions of 29-26(a)(5) governing windmill height associated with the A-1 district and agricultural uses.
  - b. WECS and their associated outbuildings/cabinets shall meet all setback requirements for primary structures for the zoning district in which the WECS is located. A WECS and its associated outbuildings and accessories shall not be located forward of the principal structure on a lot.
  - c. No other apparatus or mechanical/electronic equipment, such as telecommunication antennas, microwave dishes, or satellite dishes shall be attached to a WECS tower or its associated components such as the nacelle.
  - d. Location:
    - i. No part of a WECS shall be located within or over public drainage, utility, or other established easements
    - ii. No WECS shall be constructed, altered, or maintained so as to project above any of the airspace surfaces described in FAR Part 77 of the FAA guidance on airspace protection
    - iii. No part of the WECS, including the swept area, shall be within or overhang any portion of the property that is within a required building setback

(i) **Decommissioning.**

- (1) Discontinuation and Decommissioning - A WECS shall be considered abandoned after six (6) months without energy production, unless a plan is developed and submitted to the Enforcing Person outlining the steps and schedule for returning the WECS to service. All WECS and accessory facilities shall be removed in their entirety within 90 days of abandonment. If this is not done, the City's standard procedures for nuisance removal may be followed at the discretion of the Building Official or the official's designee.